

Design Development & Analytical Process of Small Vertical Axis Wind Turbine

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ABSTRACT

The speed of wind in meter per second. Sensor plays an important role in censoring the velocity of wind. The design and fabrication operations, we evaluate the performance of machine through the show experimental setup. Experimental setup consists assembly of various component and equipment already described at initial phase. Blower, Anemometer and sensor are other equipment for facilitation of procedure. When we start the blower, the wind velocity strikes the blades of rotor, which start rotating due to its effect.

KEYWORDS: Two blade VAWT, Weighing machine for force measurement, Tachometer/Stroboscope for rpm, Anemometer for wind velocity

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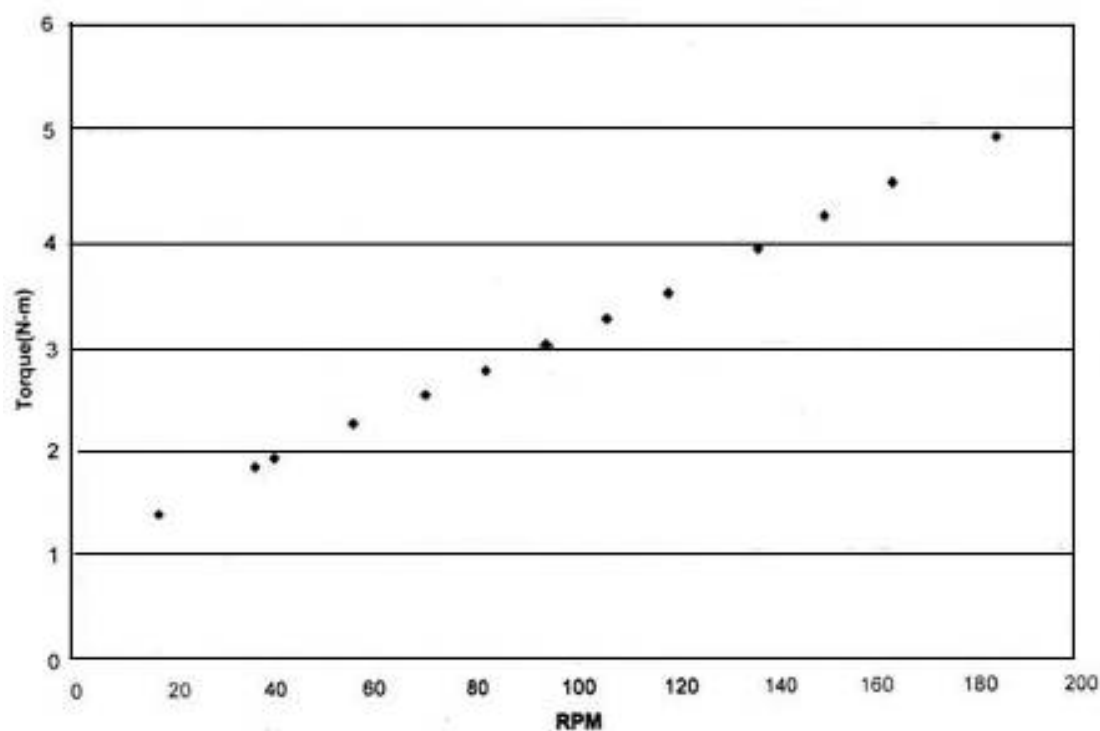
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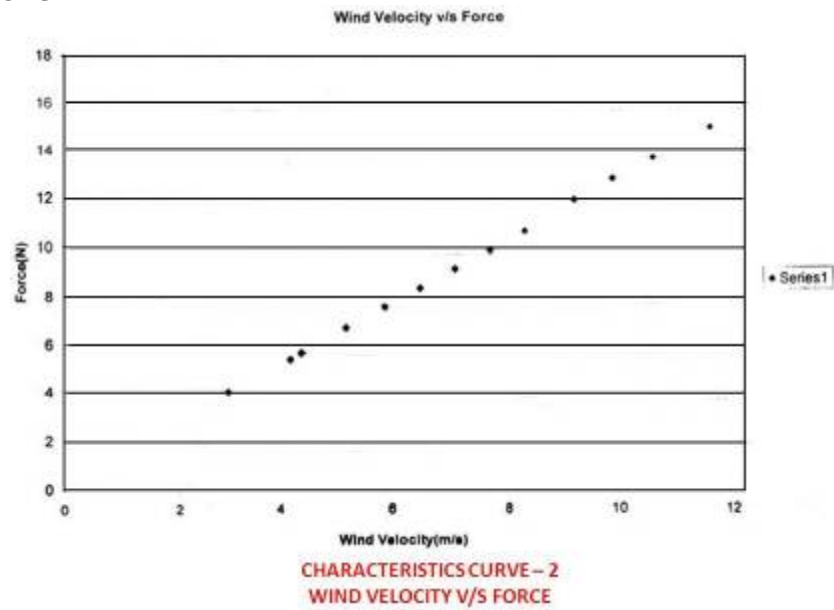


CHARACTERISTICS CURVE - 1 RPM V/S TORQUE

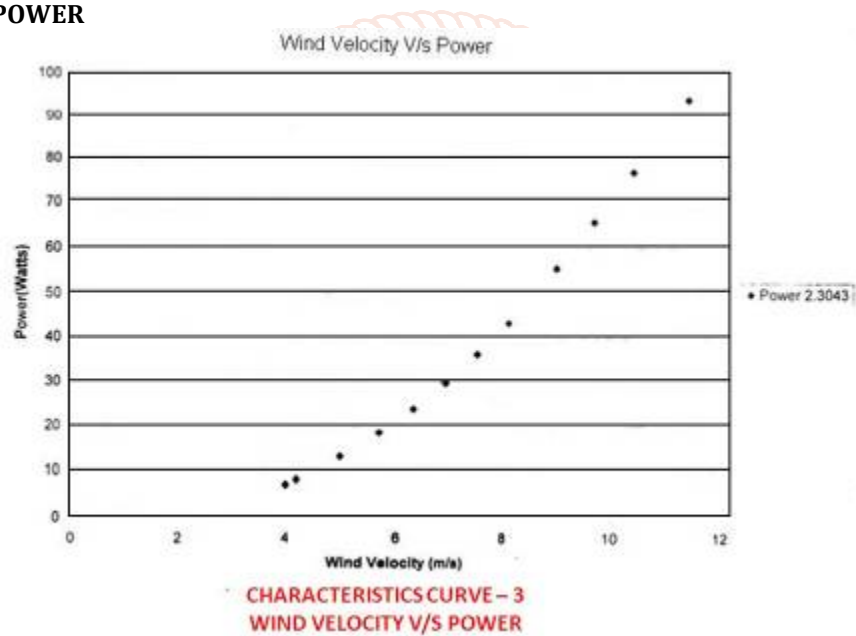


**CHARACTERISTICS CURVE - 1
RPM V/S TORQUE**

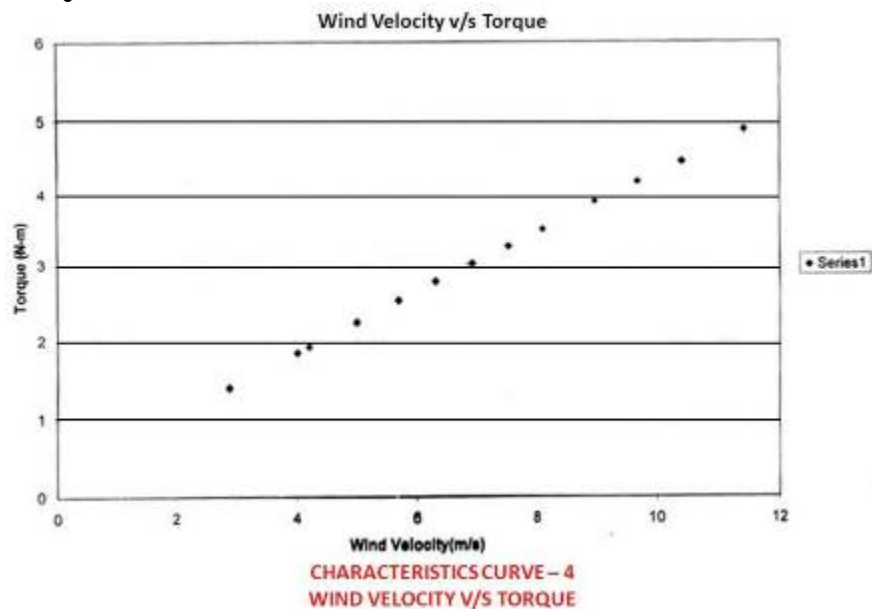
CHARACTERISTICS CURVE - 2 WIND VELOCITY V/S FORCE



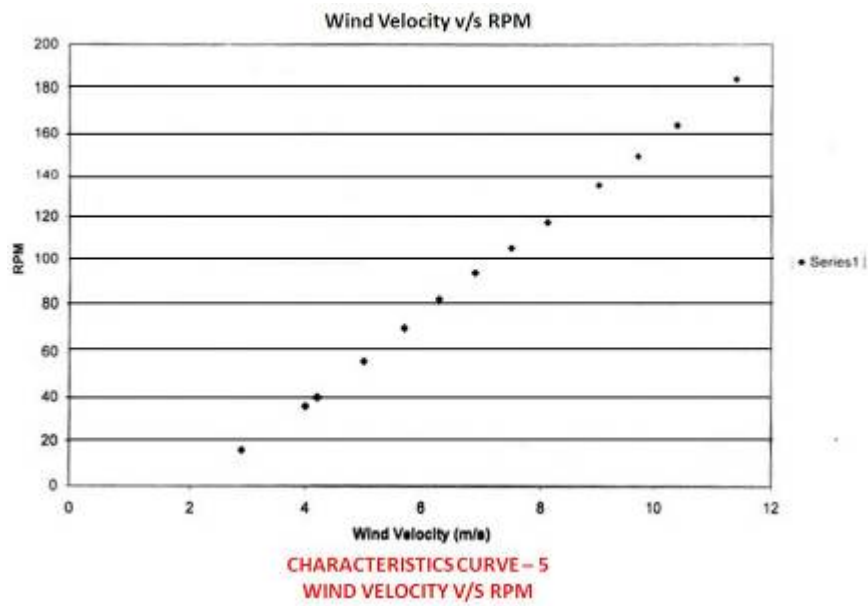
CHARACTERISTICS CURVE - 3 WIND VELOCITY V/S POWER



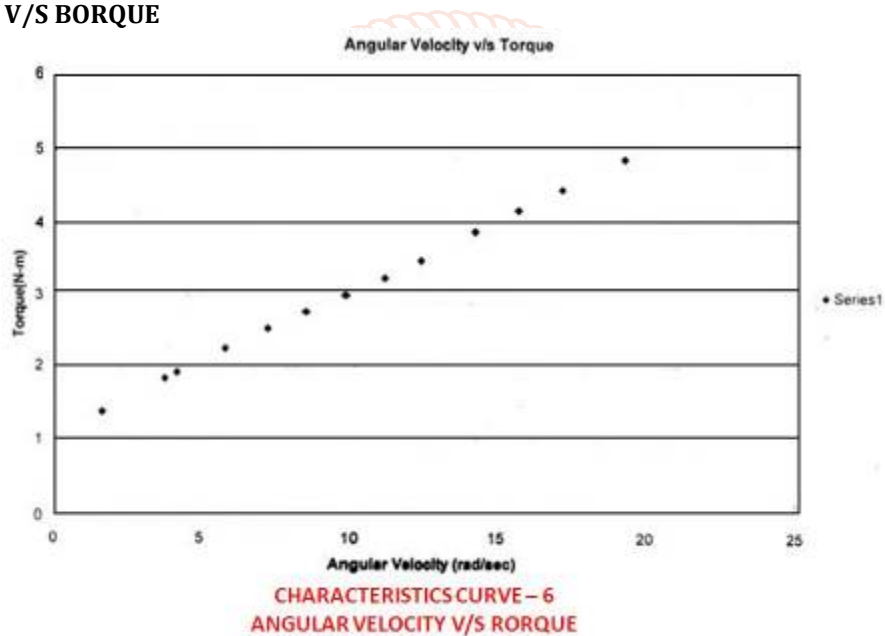
CHARACTERISTICS CURVE - 4 WIND VELOCITY V/S TORQUE



CHARACTERISTICS CURVE - 5 WIND VELOCITY V/S RPM



CHARACTERISTICS CURVE - 6 ANGULAR VELOCITY V/S BORQUE



CHARACTERISTICS CURVE - 7 WIND VELOCITY V/S ANGULAR VELOCITY

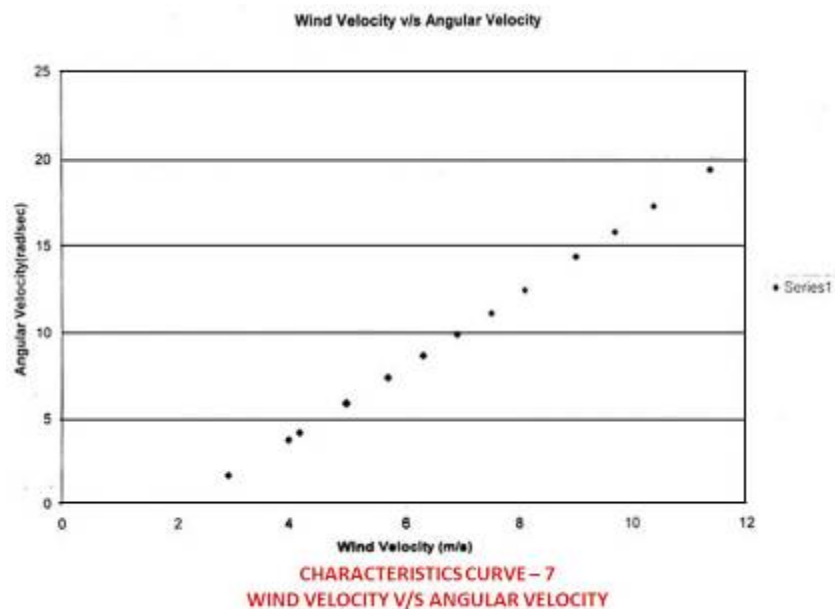


FIG.

DRAWING OF DESIGN DEVELOPMENT FABRICATION AND TESTING OF SMALL VERTICAL AXIS WIND TURBINE

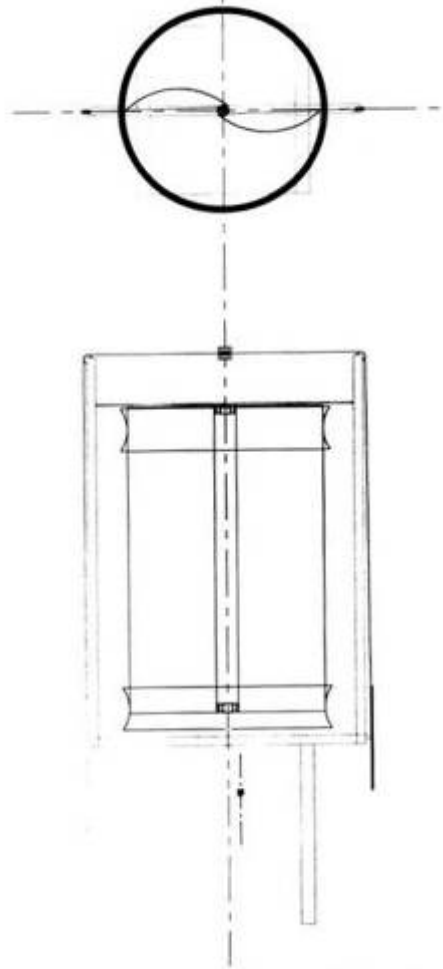


Fig 1 Drawing of Design Development Fabrication and Testing of Small Vertical Axis Wind Turbinr



PHOTO 1 EXPERIMENTAL SETUP OF SMALL VERTICAL AXIS WIND TURBINE



PHOTO 2 EXPERIMENTAL SETUP OF SMALL VERTICAL AXIS WIND TURBINE

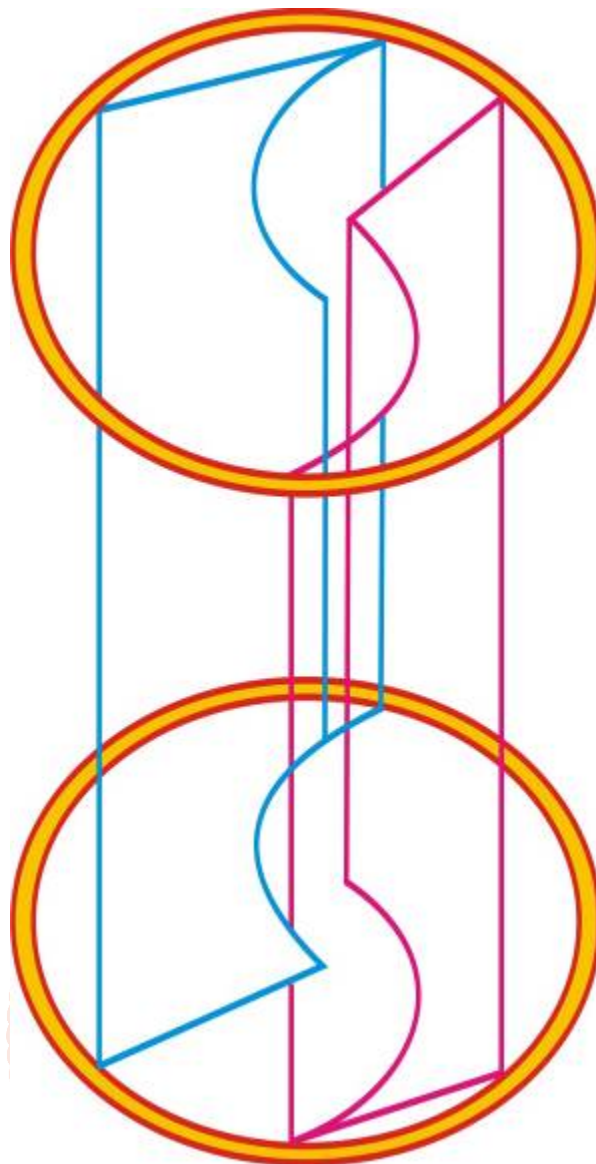


PHOTO 3 EXPERIMENTAL SETUP OF SMALL VERTICAL AXIS WIND TURBINE

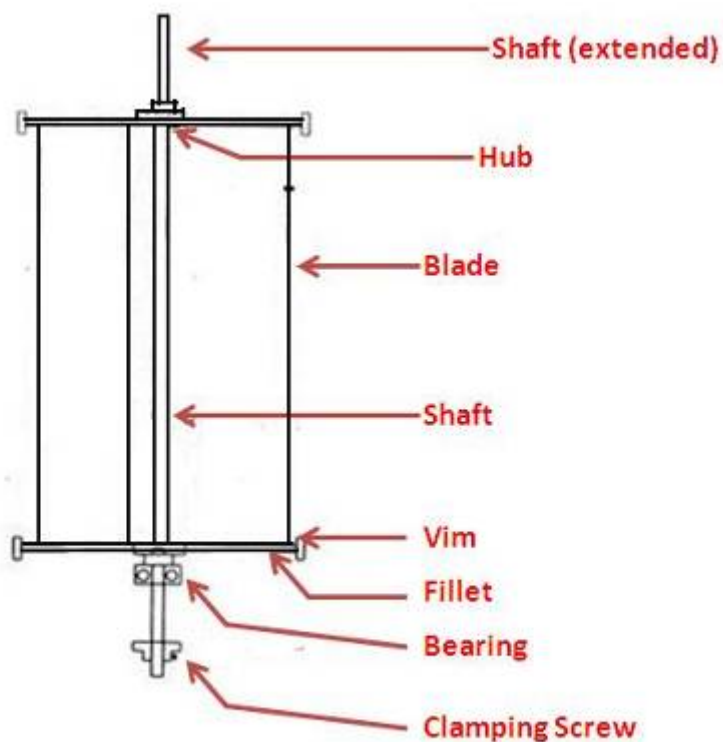
Observations					
Wind Velocity	RPM	Force(N)	Angular Velocity	Torque	Power
2.9	16	4.312	1.67	1.3798	2.3043
4	36	5.7232	3.768	1.8314	6.9007
4.2	40	5.978	4.186	1.913	8.0078
5	56	6.9972	5.86	2.239	13.1205
5.7	70	7.889	7.327	2.5245	18.497
6.3	82	8.6534	8.583	2.769	23.766
6.9	94	9.4178	9.839	3.0137	29.652
7.5	106	10.1822	11.095	3.2583	36.1508
8.1	118	10.9466	12.351	3.5029	43.2643
9	136	12.1912	14.235	3.9012	55.5336
9.7	150	13.083	15.7	4.1866	65.7296
10.4	164	13.9748	17.165	4.4719	76.76
11.4	184	15.2488	19.259	4.8796	93.976



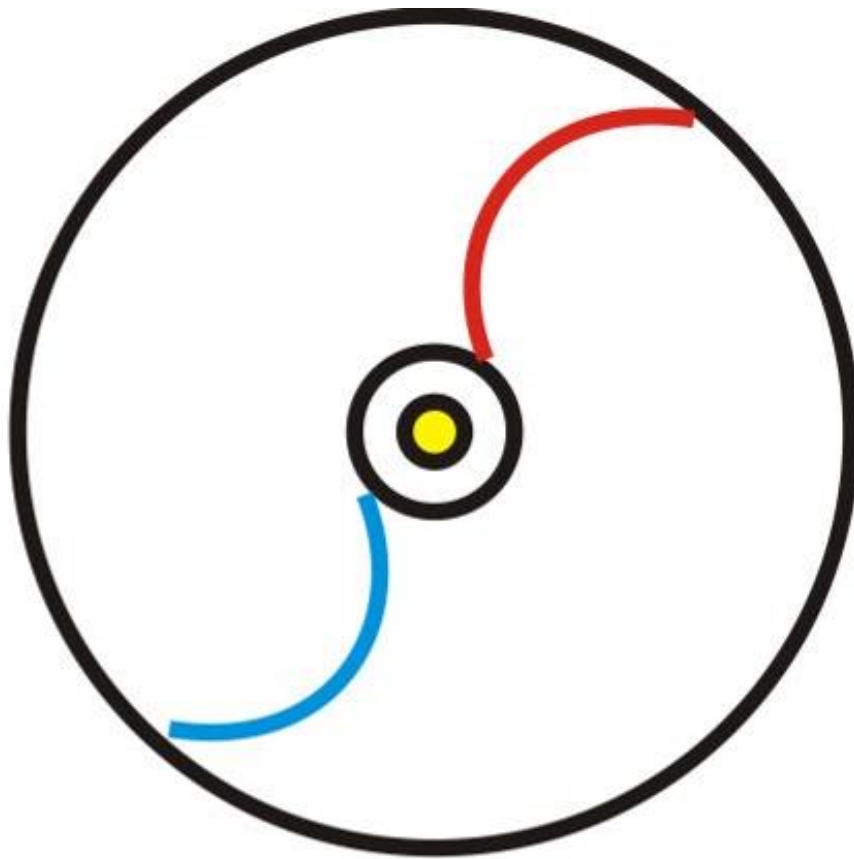
Detail Assembly Drawing of Design, Development, Fabrication and Testing of Small Vertical Axis Wind Turbine



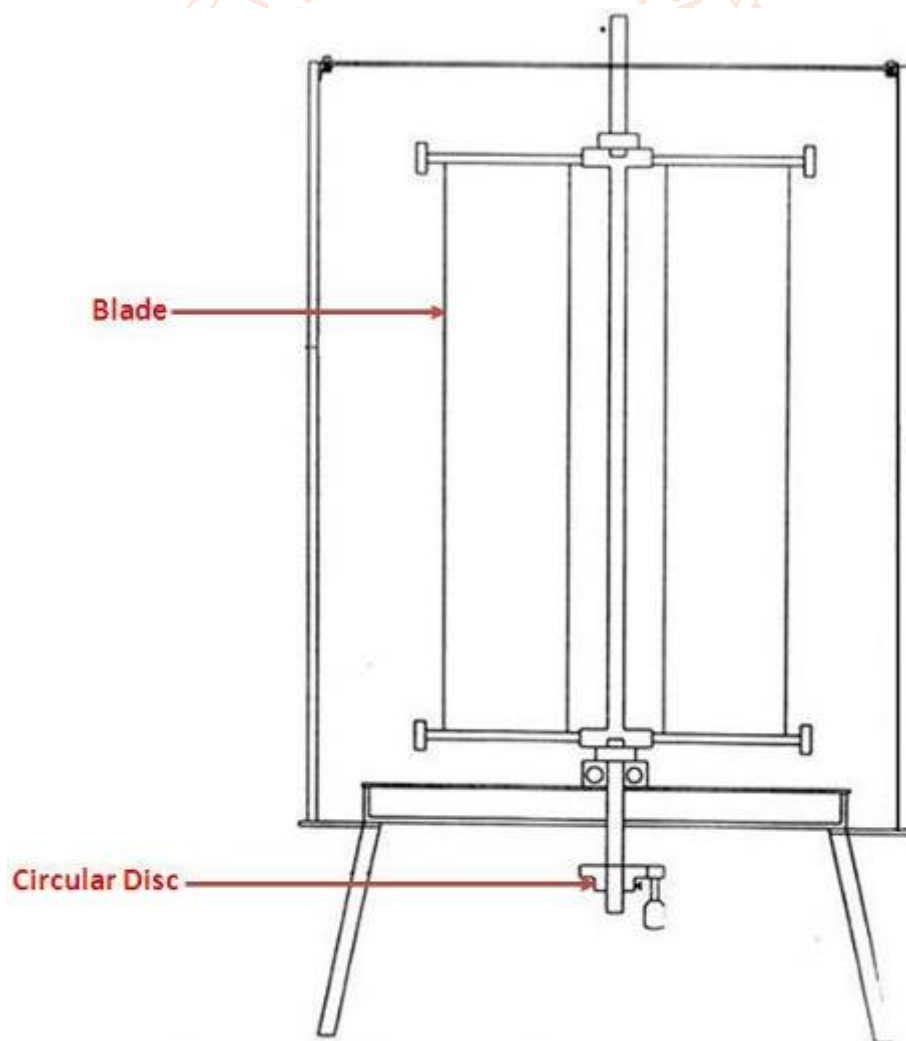
Two Blade Vertical Axis Wind Turbines



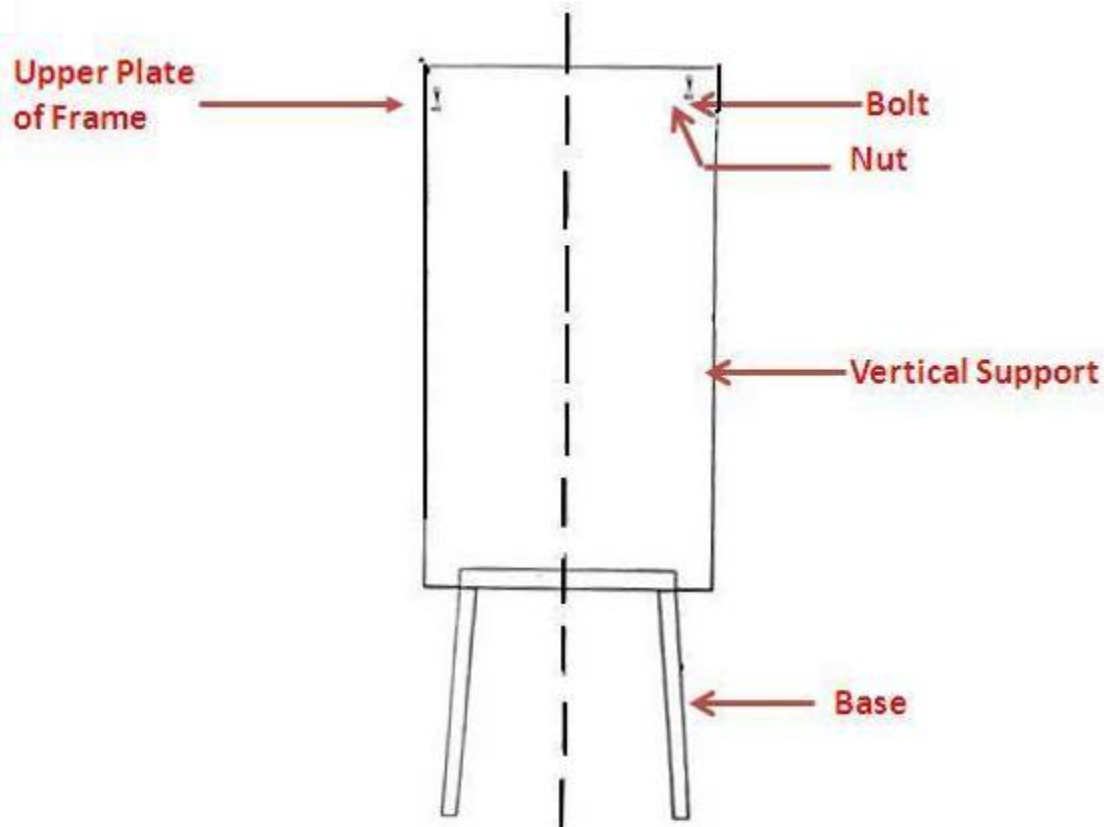
Section of Two Blade Vertical Axis Wind Turbine



Plan of Rotor Assembly of Two Blade Vertical Axis Wind Turbine



Elevation of Two Blade Vertical Axis Wind Turbine



Part Elevation of Two Blade Vertical Axis Wind Turbine



Plan Frame Assembly of Two Blade Vertical Axis Wind Turbine

ECONOMY

The machine can work at very minimum wind velocity i.e. 4-6 m/s, which available throughout the year, but we assume average wind available only 10 months in a year, then 10 months x 30 days x 24 hours = 7200 hrs.

And, expected power generation of machine $25W = 25 / 1000 \text{ KW}$

Then,

Total power in one year = $7200 \times 25/1000 = 180$

At present 1 KW Hr. = Rs. 3.00

Then $180 \times 3 = \text{Rs. } 540.00$

Cost of Machine = Rs 1800.00

So, we can say Payback in four years.

Also, expected life of machine = 8 years

So, remaining 4 years we can do the servicing of machine and change deteriorated parts like bearing, blades etc. and thus use for long time by employing such type maintenance

CONCLUSION:-

Before going to conclude the topic it would be necessary to review the brief comparison of horizontal axis wind turbine and vertical axis wind turbine.

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